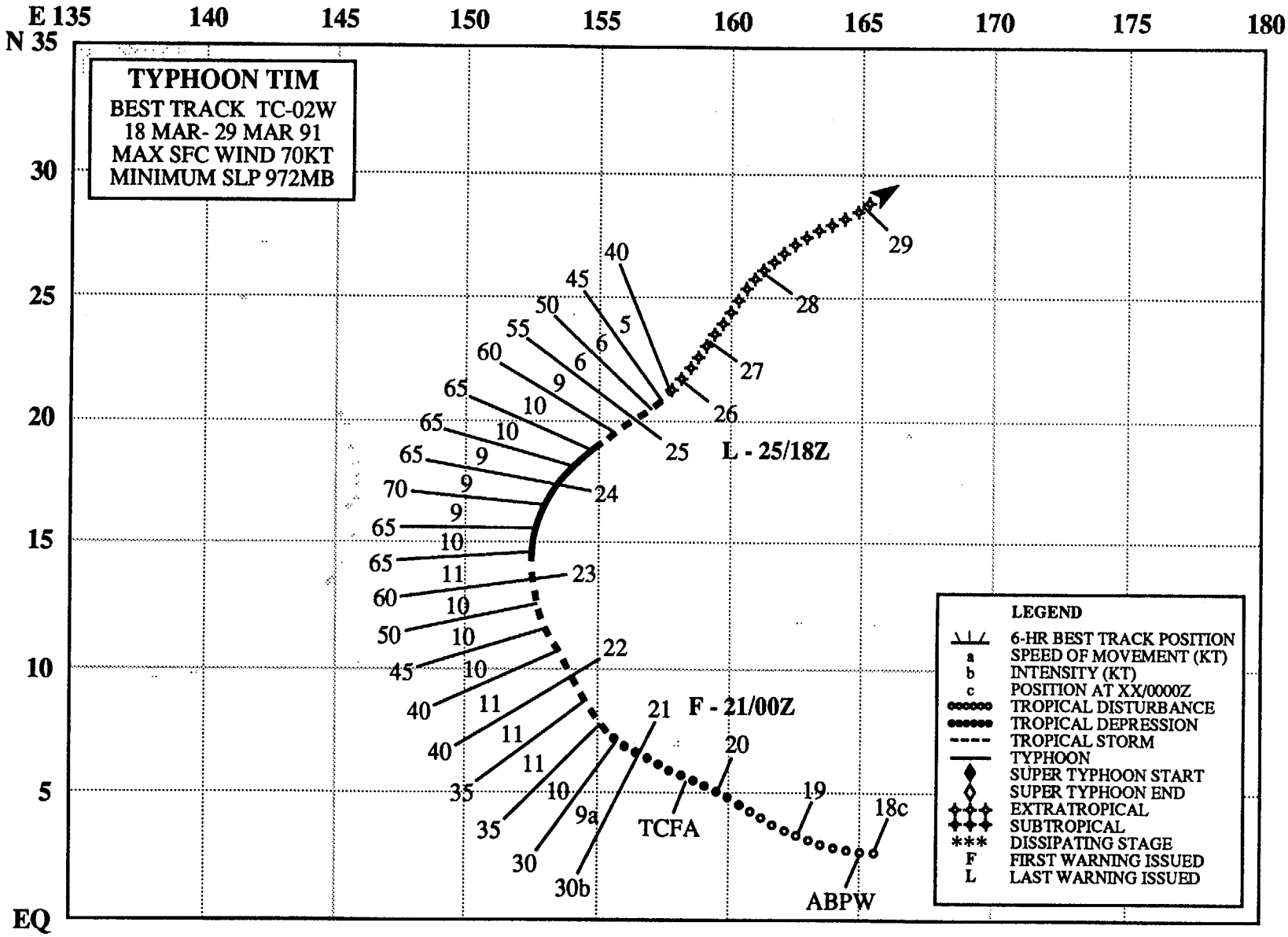
E 135
140
145
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170
175
180
N 35
30
25
20
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10
5
EQ
TYPHOON TIM
BEST TRACK TC-02W
18 MAR- 29 MAR 91
MAX SFC WIND 70KT
MINIMUM SLP 972MB
L - 25/18Z
F - 21/00Z
TCFA
ABPW
LEGEND
6-HR BEST TRACK POSITION
SPEED OF MOVEMENT (KT)
INTENSITY (KT)
POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
SUBTROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED

# TYPHOON TIM (02W)

## I. HIGHLIGHTS

Tim was the second tropical cyclone to develop in the eastern Caroline Islands during the month of March. It was the first March typhoon since 1982, and marked only the third time since the Joint Typhoon Warning Center was established in 1959 that multiple storms occurred in March. The recurvature track taken by Tim proved to be a difficult challenge for JTWC forecasters to predict, because the primary prognostic guidance was slow to predict the changing synoptic situation. Average forecast errors for Tim were the largest of any Northwest Pacific tropical cyclone forecast in 1991.

## II. TRACK AND INTENSITY

As the Southern Hemisphere Tropical Cyclone, 16P (Cynthia), intensified in the Coral Sea on 18 March, analysis of the surface and gradient-level wind flow in the tropics indicated that a westerly surge was again established along the equator east of New Guinea. Just two weeks after Sharon (01W) formed in the eastern Caroline Islands, the near-equatorial trough reestablished itself in the same area with associated pressure falls and increased cloudiness. The first mention of a developing tropical disturbance (Tim) appeared on the 18 March Significant Tropical Weather Advisory. Later, based on a 38 kt (20 m/sec) gradient-level wind at Pohnpei (WMO 91348) and a 2-day pressure fall of 2 to 3 mb, a Tropical Cyclone Formation Alert was issued at 200500Z. The first warning on Tropical Depression 02W followed at 210000Z when satellite imagery located a poorly defined cloud vortex that was aligned with the synoptic data.

As it tracked northwestward, Tim was upgraded to a tropical storm at 211800Z due to an increase in the amount of deep convection. The track became more northerly as a series of fast-moving short waves in the polar westerlies eroded the narrow subtropical ridge, allowing Tim to move towards the break in the ridge. At 230600Z, typhoon intensity was attained when Tim developed a large, ragged eye (Figure 3-02-1). Tim arrived at its point of recurvature 420 nm (780 km) east of Saipan. Twelve hours after recurvature, the typhoon reached a peak intensity of 70 kt (35 m/sec) and then began to weaken gradually due to increased vertical shear. Tim transitioned to an extratropical low on 25 March.

## III. FORECAST PERFORMANCE

JTWC's larger than average overall forecast errors on this typhoon were a consequence of over-reliance on guidance from its primary aids (Figure 3-02-2) which weren't representative of the changing synoptic situation. Initially, the majority of JTWC's forecast aids indicated Tim would move along a climatologically favored west-northwestward track, steered by the flow south of the narrow subtropical ridge. Post-analysis of the synoptic situation showed that Typhoon Tim tracked north-northwestward into a neutral point in the subtropical ridge located east of Saipan. This neutral point was identified in the 200000Z NOGAPS prognostic series used to develop the first warning, but based on the depiction of the forecast aids, recurvature was not considered a likely scenario. Recurvature was discussed as a moderate probability alternate scenario on JTWC's first warning, but when the dynamic aids OTCM and FBAM continued to indicate Tim would turn to the west and remain south of the ridge axis, the recurvature philosophy was discarded in favor of a "stairstep" track which agreed more closely with the prognostic aids. Supporting NOGAPS prognostic fields indicated the portion of the subtropical ridge east of the neutral point would build westward (and to the north of the cyclone) and cause Tim to continue moving northwestward. JTWC warnings reflected this forecast reasoning, and as a result,

failed to identify in the early stages of development that Tim's more northward motion was a precursor to recurvature. In particular, JTWC's overall best performing forecast aid, OTCM, missed the recurvature point entirely.

Typhoon Tim intensified at a normal rate of development, and its intensification and extratropical transition were well forecast by JTWC.

IV. IMPACT

No reports of significant damage or loss of life were received as Tim remained over open ocean well away from land during its life.

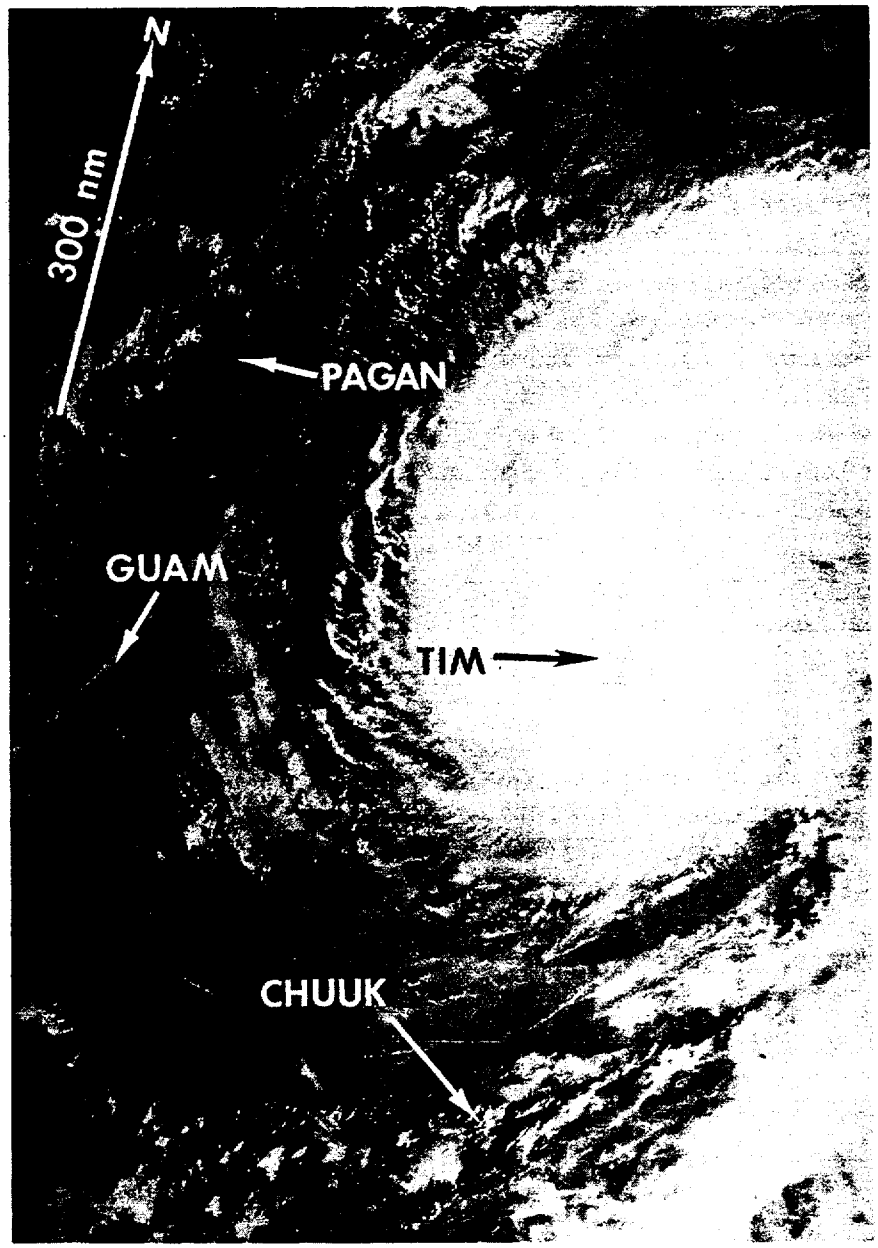


Figure 3-02-1. Satellite imagery of the large, cloud-filled eye of Typhoon Tim approximately 12 hours prior to reaching maximum intensity (230431Z March NOAA visual imagery).

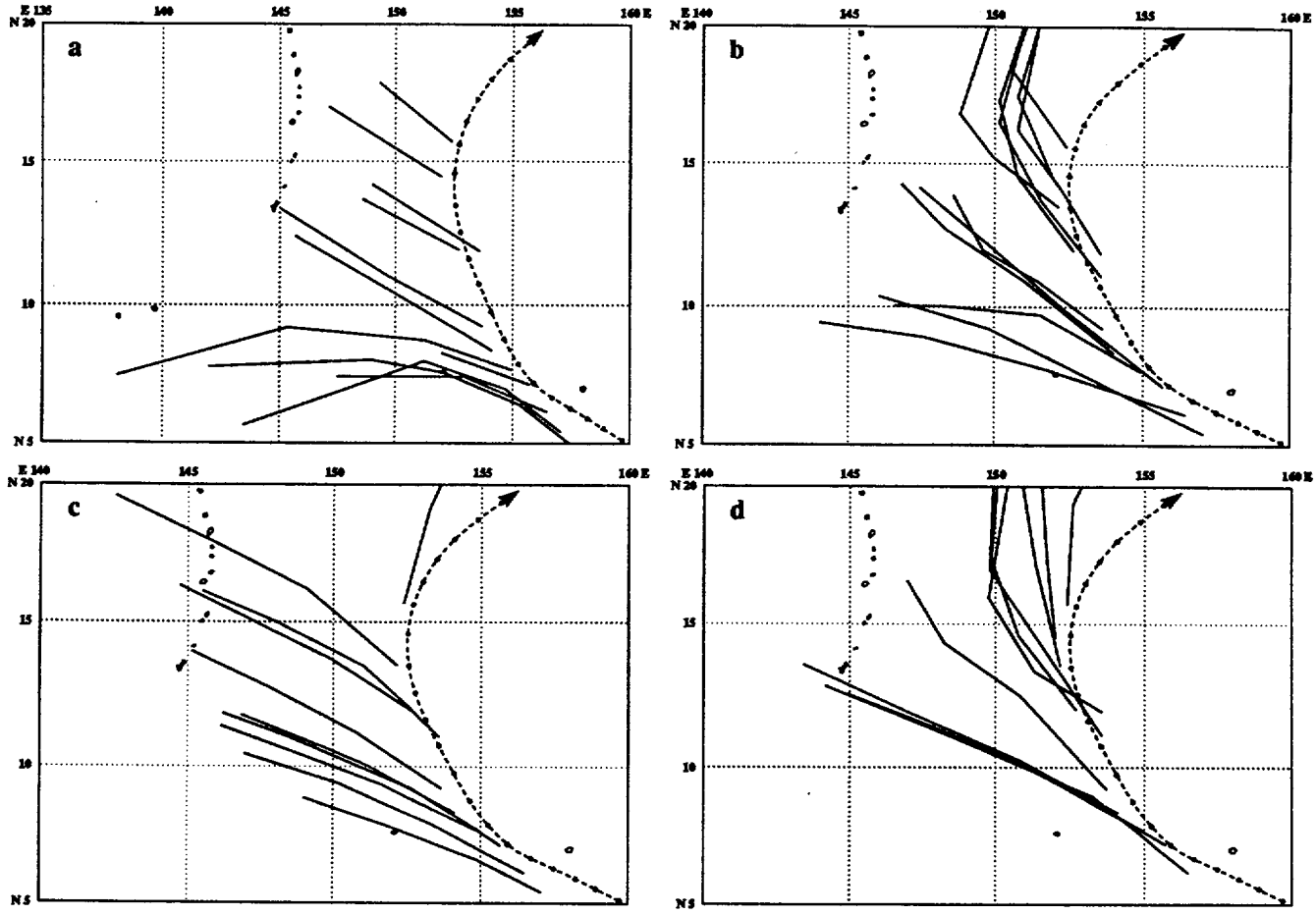


Figure 3-02-2. JTWC's primary forecast aids [a) OTCM, b) FBAM, and c) the CSUM] remained consistently left of track. While the official JTWC forecasts [d) JTWC] were consistently to the right of the other aids, in retrospect, they were not far enough to the right.